

In the Claims:

Please cancel Claims 14, 17, and 40 without prejudice, amend Claims 1-13, 16, 18-39 and 41-43 as shown below, and add new Claims 24-28 prior to calculating the fees due for this patent application. A complete copy of the claims including marked-up versions of each claim which is amended in this Preliminary Amendment appears below.

- 1 1. (Currently Amended) A solid state laser gain medium having first and second ends along a laser optical axis in which at least one end is profiled to provide a level of thermal lensing at a predetermined operating power, in which the predetermined beam quality is ~~centred~~ centered substantially on a maximum at the predetermined operating pump power.
- 1 2. (Currently Amended) A solid state laser gain medium as ~~claimed in claim 1~~ defined in Claim 1, in which both ends of the solid state laser gain medium are profiled.
- 1 3. (Currently Amended) A solid state laser gain medium as ~~claimed in any preceding claim~~ defined in Claim 1, in which the solid state laser gain medium is formed of Nd:YAG.
- 1 4. (Currently Amended) A laser oscillator cavity including a solid state laser gain medium as ~~claimed in any preceding claim~~ defined in Claim 1.

1 5. (Currently Amended) A laser oscillator cavity as ~~claimed in claim 4 defined in~~  
2 Claim 4, further comprising comprising:  
3 flat cavity end reflectors.

1 6. (Currently Amended) A laser oscillator cavity as ~~claimed in any of claims 3 to 5~~  
2 defined in Claim 4, further comprising comprising:  
3 a Q-switch having first and second acousto-optic cells and respective first and  
4 second non-parallel polarisation polarization orientations.

1 7. (Currently Amended) A laser oscillator cavity as ~~claimed in any of claims 4 to 6~~  
2 defined in Claim 4, further including a Q-switch comprising comprising:  
3 at least one acousto-optic cell having a reflective end forming a cavity end  
4 reflector.

1 8. (Currently Amended) A laser oscillator cavity as ~~claimed in any of claims 3 to 7~~  
2 defined in Claim 4, further comprising  
3 a frequency converter; and  
4 a frequency selective reflector between the solid state laser gain medium and the  
5 frequency converter.

1 9. (Currently Amended) A laser including a solid state laser gain medium as ~~claimed~~  
2 ~~in any of claims 1 to 2 or a cavity as claimed in any of claims 3 to 8. defined in Claim 1.~~

1 10. (Currently Amended) A laser as ~~claimed in claim 9~~ defined in Claim 9, further  
2 comprising comprising:  
3 a side-pumping diode element.

1 11. (Currently Amended) A Q-switch for a laser comprising comprising:  
2 first and second acousto-optic cells in respective first and second non-parallel  
3 polarisation polarization orientations.

1 12. (Currently Amended) A Q-switch as ~~claimed in claim 11~~ defined in Claim 11,  
2 further comprising comprising:  
3 a reflective surface arranged to form a laser cavity mirror.

1 13. (Currently Amended) A laser including a Q-switch as ~~claimed in claim 11 or claim~~  
2 12. defined in Claim 11.

14. (Cancelled).

1 15. (Original) An optical gain cavity including a gain medium and arranged to operate  
2 at a substantially maximum beam quality for a predetermined operating power.

1 16. (Currently Amended) A laser cavity comprising comprising:  
2 as a laser cavity element, element;  
3 a first end reflector, reflector;  
4 an output end reflector reflector; and  
5 a gain medium provided there between, between the first end reflector and the  
6 output end reflector, the cavity further comprising comprising:  
7 as a laser cavity element frequency converter between the gain medium and  
8 the output end reflector reflector; and  
9 a frequency selective reflector between the gain medium and the frequency  
10 converter in which the laser cavity elements are aligned on a common physical  
11 axis.

17. (Cancelled).

1 18. (Currently Amended) A laser cavity a claimed in claim 16 or 17 as defined in  
2 Claim 16, wherein the frequency selective reflector and the output end reflector are  
3 arranged to output laser light converted by the frequency converter to be used at a  
4 workpiece at the converted frequency.

1 19. (Currently Amended) A laser cavity as claimed in claim any of claims 16 to 18  
2 defined in Claim 16, in which the frequency converter is a second harmonic generator.

1 20. (Currently Amended) A laser cavity as ~~claimed in any of claims 16 to 19 defined~~  
2 ~~in Claim 16~~, in which the output end reflector reflects the fundamental frequency  
3 generated by the gain medium.

1 21. (Currently Amended) A laser cavity as ~~claimed in any of claims 16 to 20 defined~~  
2 ~~in Claim 16~~, in which the frequency converter has a large acceptance angle.

1 22. (Currently Amended) A laser including a laser cavity as ~~claimed in any of claims~~  
2 ~~16 to 21~~. defined in Claim 16.

1 23. (Currently Amended) A laser ablation device comprising a laser as ~~claimed in~~  
2 ~~claim 9, claim 13 or claim 22~~. defined in Claim 9.

1 24. (Currently Amended) A method of profiling a laser gain medium end ~~comprising~~  
2 comprising:

3 ~~to provide~~ providing a level of thermal lensing at a predetermined pump power  
4 such that a predetermined beam quality is achieved at the predetermined pump power.

1 25. (Currently Amended) A method of controlling pumping of a Q-switched pulsed  
2 laser ~~comprising~~ comprising:  
3 reducing pump power to a quiescent level between bursts of laser pulses.

1 26. (Currently Amended) A laser amplifier having:  
2 a laser cavity; and  
3 an amplifying module external to the laser cavity, said amplifying module sharing  
4 a common axis of emission with said laser cavity and comprising a gain medium having  
5 first and second ends along said axis of ~~emission~~, emission;  
6 whereby at least one of said first or second ends is profiled so as to directly couple light  
7 from said laser cavity into said amplifying module.

1 27. (Currently Amended) A laser amplifier as ~~claimed in claim 26 defined in Claim~~  
2 26, wherein one or both of said first or ~~an~~ second ends are profiled to form a lens having  
3 a predetermined focal length.

1 28. (Currently Amended) A laser amplifier as ~~claimed in claim 26 defined in Claim~~  
2 26, wherein said laser comprises a gain medium with profiled ends.

1 29. (Currently Amended) A laser amplifier as ~~claimed in claims 27 or 28 defined in~~  
2 Claim 27, in which the lens is one of a refractive lens, a diffractive lens, or a GRIN lens.

1 30. (Currently Amended) A laser amplifier as ~~claimed in claims 27 or 28 defined in~~  
2 Claim 27, wherein said laser gain medium ends are profiled to form a lens having a  
3 predetermined focal length.

1 31. (Currently Amended) A laser amplifier as ~~claimed in any of claims 27 to 28~~  
2 defined in Claim 30, wherein said lens of said laser gain medium and said lens of  
3 amplifier gain medium have substantially equal focal lengths.

1 32. (Currently Amended) A laser amplifier as ~~claimed in any preceding claim~~ defined  
2 in Claim 30, whereby said laser gain medium lens and said amplifier gain medium lens  
3 are concavely profiled.

1 33. (Currently Amended) A laser amplifier as ~~claimed in any preceding claim~~, defined  
2 in Claim 26, wherein said laser and said amplifying medium are pumped simultaneously.

1 34. (Currently Amended) A laser amplifier as ~~claimed in claim 33~~ defined in Claim  
2 33, wherein said laser pump and said amplifying pump have equal power.

1 35. (Currently Amended) A laser amplifier as ~~claimed in any preceding claim~~ defined  
2 in Claim 26, in which an input surface to the amplifier is tilted.

1 36. (Currently Amended) An optical amplifier module ~~comprising~~ comprising:  
2 a medium having first and second ends, at least one end being profiled to provide a  
3 level of lensing at a predetermined operating power, arranged such that, in use, the  
4 amplifier can be directly coupled to a laser of predetermined parameters.

1 37. (Currently Amended) A module as ~~claimed in claim 33~~ defined in Claim 33, in  
2 which, for an amplifier medium comprising a rod of diameter  $D_R$ , length  $L_R$ ,  
3 refractive index  $n_L$ , ~~in air of~~ refractive index ~~n<sub>air</sub> of air~~  $n_{air}$ , and thermal focal length  
4  $f_{th}$  arranged to receive an input beam from a laser having waist distance  $d_0$  from the  
5 input rod end, the rod is profiled with a radius of curvature  $R$  given approximately by

6 
$$R = \frac{d_0(4f_{th} - L_R)(n_L - n_{air})}{n_L(4f_{th} - L_R - 2d_0)}.$$

1 38. (Currently Amended) A method of making a laser amplifier module gain medium  
2 comprising comprising:  
3 profiling at least one end thereof to provide a level of lensing at a predetermined  
4 operating power, arranged such that that, in use, the amplifier can be directly coupled to a  
5 laser of predetermined parameters.

1 39. (Currently Amended) A method of designing a laser amplifier as ~~claimed in any~~  
2 ~~preceding claim~~ comprising identifying a profile as defined in ~~claims 11 or 12~~ Claim 34.

40. (Cancelled).

1 41. (Currently Amended) A method of controlling pumping in a Q-switched, pulsed  
2 laser comprising comprising:

3           reducing pump power below the laser cavity lasing threshold prior to full-power  
4    pumping.

1    42.    (Currently Amended) A method of converting laser frequency in a laser cavity

2    comprising comprising:

3           cooling a frequency converter in the laser cavity to below an optimum frequency  
4    conversion temperature while the laser is in a non-lasing state.

1    43.    (Currently Amended) A laser assembly comprising a gain medium cavity, laser or

2    switch as claimed in any of claims 1 to 22 defined in Claim 1 and an amplifier or module

3    as claimed in any of claims 26 to 37 defined in Claim 26 coupled therewith.